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VIEWS, NEWS AND INTERVIEWS.

Real estate sales, horse auctions, bicycle races and out-door games under electric light have become settled institutions.

An unusual electrical accident, which recently occurred at the Norfolk Navy Yard, appears to have been explained, and with the explanation comes the necessity of making provision to ground steel or iron vessels that are in dry dock, especially during the season of electrical storms. Two men standing in water under the vessel, which was insulated by its supports of dry wood, were apparently struck by lightning, although men on the deck of the vessel felt no shock. One of the men was killed instantly and the other died in a few hours. The explanation now given is that the vessel was not struck by lightning in the ordinary sense, but that it acted as an enormous condenser, such as is used for collecting static electricity. As it was insulated from the ground it became heavily charged, and was discharged through the men when they, standing in the water, and thus making a good ground, touched the metal sides. The remedy will be to ground such vessels while they are in dry dock.

It is reported that the prices on street cars have declined about 25 per cent during the past two years.

The electric street lights in Bath, England, recently failed from a peculiar cause. An official report says that the failure was due to a sparrow's nest having been built in the pipe which conveys the leads up the side of a building to a certain lamp. The nest probably pressed the leads close to the side of the pipe, and the rain trickling down the pipe saturated the nest with moisture, forming a semi-connecting circuit between them. These leads (or conductors) are covered externally with prepared hemp and jute, which absorb moisture readily, and when they become saturated act in conjunction with the insulating material beneath them as a kind of condenser. When in this condition they are sufficiently close together for a small induced spark to pass, which ultimately destroys the insulation. This appears to have occurred in the present case, with the result that the nest took fire and the insulation broke down at this point.

Paper telegraph poles are the latest development of the art of making paper useful. These poles are said to be made of paper pulp, in which borax, tallow, etc., are mixed in small quantities. The pulp is cast in a mould with a core in the center, forming a hollow rod of the desired length, the cross pieces being held by key-shaped wooden pieces driven in on either side of the pole. The paper poles are said to be lighter and stronger than those of wood, and to be unaffected by sun, rain, dampness or any of the other causes which shorten the life of a wooden pole.

Even the Coreans are familiar with the electrical current. A number of political plotters recently laid a mine charged with 1,200 pounds of gunpowder for the purpose of blowing up the King of Corea and members of his cabinet. The mine was to be fired by a fuse which was to be ignited by an electric spark. Happily, the plot was discovered, the electrical connections were broken and the conspirators captured and beheaded.

TELEPHONIC REMINISCENCES.

BY CHARLES H. MERZ, A. M., M. D., SANDUSKY, OHIO.

At the present time, when the telephone system has reached such a marvelous degree of perfection, when wires, 'phones, transmitters, operators and subscribers have multiplied by the thousands, a glance back reveals much that is of interest and perhaps some facts of value.

From the many sources of information at hand, it would seem that the telephone first attracted public attention from a business and practical point of view about the year 1877. Possibly its value in a commercial sense was recognized at a little earlier date, but practically speaking this year signalized the commercial development of the instrument.

FIG. 1.—TELEPHONE RECEIVER USED BY DR. MERZ IN THE SPRING OF 1878.

FIG. 2.—ONE OF DR. MERZ'S INSULATORS, MADE OF PINE WOOD AND A BROKEN BOTTLE NECK.

I recall distinctly that, while only a boy, in the year 1878 or 1879 I became interested in the subject of electricity, and it was while on a brief visit to Cincinnati in the Spring of 1878 that my attention was first directed to the electric telephone. While I had been much interested in the acoustic telephone, the so-called "Lover's Telephone," and had constructed several experimental lines, it was at this time that I learned the fact that articulate speech could be transmitted over a wire many miles in length, and that, too, over a wire that was not necessarily stretched taut or in a straight line.

While in Cincinnati I accidentally found a firm that was selling the "electric telephone," or, at least, the component parts of the telephones, receivers only, and that these parts might be purchased at a very reasonable price.

Interested deeply in the matter, I made some inquiries and found that a lawsuit was at the time pending, and that if I desired to secure the instruments it would be necessary to do so at once, as at any moment an injunction might be granted, thus putting a stop to the sales. I was allowed to test the instruments. Wonder of wonders! I was able to converse with another party in a distant room over a line that made no end of curves, was even twisted into knots at many points, and yet I heard plainly and clearly.

My astonishment knew no bounds. It seemed impossible to realize the fact. All previous mentions of the electric telephone were condensed into this one wonderful test.

Urged by the manufacturers, it required but a few moments to make up my mind. I paid the price asked and departed, the happy possessor of a package of goods—the contents of which I knew little or nothing. I might as well have bought a prize package for I had no knowledge whatever as to the use or the handling of the articles enclosed. I was informed that I would find the necessary instructions enclosed.

Happy in my purchase, I hastened home, eager to test the value of my newly found wonder. Alas! for the hours of study, experimentation and genuine anxiety that followed. I began to believe that I had bought materials that were worthless to me.

The real principal of the telephone was at this time new to me. In fact it was new to nearly every one. The question was, how to adjust and arrange the parts. At this date current literature contained no instructions. Text books gave no information; those experienced in the use of

electricity in other branches could give no aid in this branch. Perseverance, at least so far as the construction of the 'phone was concerned, finally won. I had an instrument that would at least indicate the interruptions of an electric current. So far the instrument was a toy—perhaps even less. I had no use for it. To be sure it was a telephone, but what could I do with it? To use it I must have a line. This was a serious question to me. The cost of telegraph wire was far beyond my reach. Catalogues were searched in vain for a cheap wire. Finally, after much reflection and careful search, I found a No. 18 soft iron wire, such as is now used for holding in place stove pipes, and from a stove dealer I purchased enough wire to construct at least part of my line.

I was at that time living at Oxford, Ohio, and my desire was to construct a line from the Oxford Female College, where I lived, to the village, one mile distant.

I entered upon my work most zealously, but a new difficulty presented itself. I must have insulators. Again the catalogues were searched with the same discouraging results. Insulators such as I must have were beyond my purse. Not to be daunted, I at once commenced to manufacture some of my own pattern, such as are shown in the accompanying illustration. Pieces of pine, cut in the shape shown, were fitted with the necks broken from discarded bottles, and I had an insulator, while not perfect as to artistic detail, was serviceable in every manner. These strips were nailed to trees and to roofs, and gave all needed support for my light wire. My insulators from an artistic point of view were unsightly—electrically they were all that could be desired—they certainly "insulated" the line.

It seems amusing now when I recall how many interested friends insisted that my wire must be run in a perfectly straight line as nearly as possible. how sedulously all curves and angles should be avoided, how the wire should be suspended in cotton rope or rubber loops, etc., and how my line should be stretched as tight as the wire would stand. Advice, as usual, was plenty; it was free.

The principles of the electric telephone were not new to me. I had read closely the results of all experiments and I was at least sufficiently well posted in electrical construction to pursue my own plans.

Need I mention the hours spent in this work of construction? Without tools, without any appliances that would facilitate or lighten my labors, I set to work, and with but little aid constructed my line, running it from tree to tree, from barn to house, and every possible way until it was finally "all up."

Before the latter portion of the line was finished, heavy storms had destroyed the first part. Nothing daunted, I persevered until I had fully constructed one mile of "stovepipe wire," soft, ungalvanized iron wire, perhaps No. 18 gauge, hung upon bottle necks broken into shape for the purpose. This was early in the year 1878. Fragments of wire, old insulators, etc., still testify as to a partial permanency of the line. A visit some 10 years later showed plainly the course of the line, and in many places the glass bottle necks were found attached to the old elm and birch trees.

So much for the line and the 'phone; the receiver as then used is here shown.

The entire outfit was necessarily one constructed and maintained upon economic principles. It was necessarily so. I had no financial aid, but little mechanical aid, and I was forced to rely upon my own ingenuity, which, in this instance, at least, "filled the bill."

At one end the line was grounded in an old well. At the other it was grounded by a rod driven in the ground, deep enough to reach moisture.

Let me say that I became during this experience an expert tree climber. I learned the art of soldering, for my splices persisted in rusting. In fact the hours spent in the broiling Summer sun will never be forgotten. In spite of it all, in the Spring of 1878, I talked over a mile of wire and I still think this was one of the earliest, if not the earliest, telephone lines actually constructed and operated.

The line was continually breaking under the swaying of the heavy winds. Mischievous boys made efforts to destroy it. Rust hastened the general disaster, but for some months this line was in actual operation. To be sure we had no exchange. We had no Blake transmitter. At each end was a sort of time card. In the absence of any means of signaling we had certain hours at which we went to the 'phone, shouted "hello" and awaited an answer.

While the Oxford line may not have been the first, I believe that it is among the first ever actually constructed, and there are to-day many people that recall the experiment with pleasure and who will no doubt certify to the date in question.

I cannot be positive, but believe the line was constructed and the old apple wood 'phones put in use fully sixteen years ago.

The obstacles overcome were necessarily numerous—they were great, but each one yielded to perseverance and a determination to make the experiment, if so it may be called, a success. My chagrin, after having attached the receivers, and no reply being received, may be imagined. It required several days to discover the fact that a wire from the spool at the end of the magnet had been accidentally broken while twisting the binding post into the wood, and, again, that my line wire had been grounded by some boys who had attached a "branch wire" for the purpose of learning what the "stovepipe" wire was for.

Communication was of a decidedly accidental nature.

The absence of signal or call bells made it absolutely necessary for the would-be "communicants" to be at their resective posts at the hours predetermined. The 'phone had to be placed to the lips, the message shouted into it, and a more or less vociferous and emphatic "Hell—o" enunciated in varying degrees of inflection and affliction before an answer could be even so much as expected.

Those of you who take down your 'phone and call for a city a thousand miles distant, fully expecting a conversation as accurate, as distinct, and withal as satisfactory as one held within the limits of your own parlor, may realize, in a small way, perhaps, the efforts of one who, justly calling himself a pioneer in telephonic experimentation, that were necessary in order to accomplish with limited facilities, imperfect instruments and a thousand obstacles, the successful accomplishment of an electrical communication *per voca* that had been but few times, if at all, attempted before the date in question.

The illustrations appended are from photographs of the 'phones and insulators used upon the original line. Even should the line in question fail to be the first of its kind, as is claimed, it is certainly one of a very early date and demands consideration for this reason, if for no other.

The dates in question are easily substantiated. Many of the now resident citizens of Oxford recall distinctly the circumstances of the "opening of the line" and one of Oxford's oldest citizens lived to speak through a wire a mile long—a feat he had heard of—one he had never dreamed of realizing.

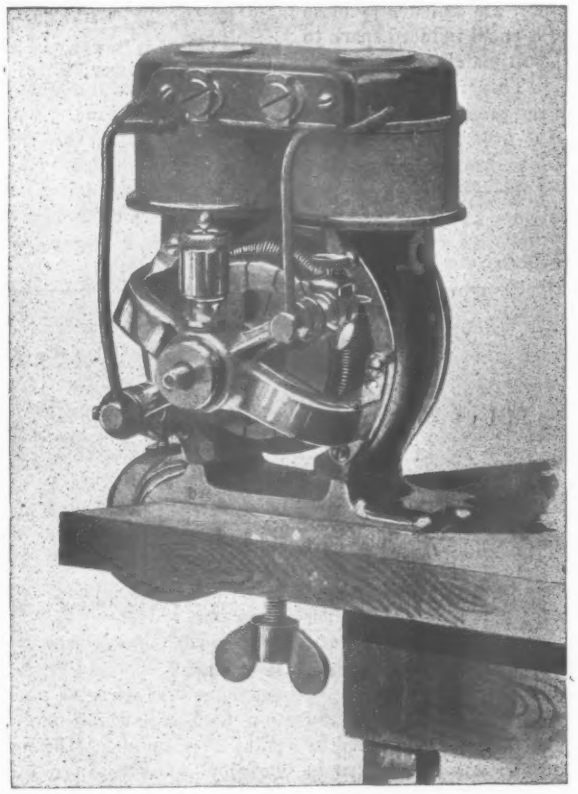

FIG. 1.—HOLTZER-CABOT ONE-EIGHTH HORSE-POWER SEWING MACHINE MOTOR, CLAMP PATTERN.

Holtzer-Cabot Fan Motor Specialties.

The Holtzer-Cabot Electric Company, Boston, Mass., have placed on the market several new motor and dynamo specialties, which are here illustrated in adjacent cuts. The one-eighth horse-power clamp motor is specially designed for attachment to sewing machines, lathes, etc., and is furnished for both direct or alternating currents. It is a variable and not a constant speed motor, and is specially adapted to all applications where the load is constant or where it is under the perfect control of the attendant. The latter machine is also furnished mounted on plain base and wound for all potentials, from battery currents of low voltage to 500 volt power circuits. A speed regulating device is supplied with these machines if desired. A window turntable permitting of speed regulation is also here illustrated. This is also furnished for both direct or alternating currents. By the addition of lamps, etc., novel and attractive effects may be produced. Motor generators, which are rapidly taking the place of primary batteries, are made by this firm in great variety. Here is illustrated the smallest size, but they are made in sizes up to 20 kilowatts. A new catalogue of these specialties has just been issued.

A Decision for the Buckeye Lamp.

On Friday, June 29, Judge Dallas, of the United States Circuit Court in Philadelphia, handed down another decision in favor of the Buckeye lamp and against the Edison Electric Light Company. The suit was brought against the Citizens' company, of Lancaster, Pa., which used Buckeye lamps. Judge Dallas decides that as an injunction has already been refused against the manufacturer, a customer cannot now be enjoined.

The decision of Judge Dallas, at Philadelphia, in respect to the Edison incandescent lamp does not open the Edison lamp to public manufacture, as has been claimed. Judge Dallas simply decided that so far as motions for preliminary injunctions were concerned where people had bought the Buckeye lamp, he would not issue such preliminary injunction, as Judge Ricks had refused to enjoin the manufacture of the Buckeye lamp. Judge Dallas said whatever might be his opinion upon the merits of the case he would not grant the preliminary injunction in conflict with that of Judge Ricks.

Viaduct Manufacturing Company Burned Out.

During a severe electrical storm on June 30 the works of the Viaduct Manufacturing Company, at Baltimore, Md., were twice struck by lightning and totally destroyed by fire. The buildings covered several acres of ground and were erected 10 years ago at a cost of $75,000. The loss was total, with an insurance of about $40,000. The plant will be rebuilt at once. About 125 hands were employed.

TELEPHONE NEWS AND COMMENT.

Holland, Mich., wants a telephone exchange.

Camden, Ark., will soon have a telephone system.

A Bell telephone exchange will be established at Edwardsville, Ill.

The Arkadelphia, Ark., Telephone Company is stringing wires for its new system.

The farmers around Massillon, O., are reported to be organizing a county telephone exchange.

Dr. R. D'Unger, of Chicago, is the latest claimant for honors as the original inventor of the telephone.

The Mutual Telephone Company, composed of local capitalists, has secured a franchise at Shelbyville, Ind.

It is rumored that the Harrison International Telephone Company will ask for a franchise at Elmira, N. Y.

The Kalamazoo, Mich., Telephone Company's ordinance has been read and adopted by a full vote of the council.

The Union Pacific coal department is erecting a telephone line between Carbon and Hanna, Wyo., a distance of 14 miles.

The Colorado Telephone Company will extend its lines from Denver to Telluride, Colo., and all the towns in the San Juan.

Telephonic communication has increased to such an extent between Aurora, Ill., and Chicago that it has been determined to put in a direct copper circuit between the two cities.

Fifteen years ago there was not a telephone exchange in the United States. To-day there are nearly 1,400 exchanges, employing 10,000 persons and furnishing service to nearly 250,000 telephone subscribers.

The West Shore Telephone Company has increased its capital stock to $30,000. It is reported that it will extend its lines to Ellenville, Pine Hill and Saugerties, N. Y., and to other points if there is sufficient demand.

Dr. K. Morgner, of St. Louis, president of the Missouri and Illinois Pan-Electric Telephone Company, thinks that Pan-Electric telephones will be in use in St. Louis within two months, either with the 42 Rogers' patents of 1885 or under expected Gray patents.

George Stuck and associates, of Selma, have applied to the Mayor and City Council for a charter for a new telephone exchange at Anniston, Ala. The system has not been stated. The new company proposes to put in telephones and exchanges at Chattanooga, Rome and Selma.

An ordinance drawn by Dr. Sweeney has been passed by the Seattle, Wash., Board of Aldermen, reducing telephone rates to $4 a month for offices and $3 for residences. Dr. Sweeney explained that there was a question as to whether the city had the right to reduce telephone rates, and the passage of the present ordinance will bring the matter to a focus.

The Harrison people have obtained a franchise at Kalamazoo, Mich., and are already getting under way to establish an exchange. Poles, wire, etc., have been purchased and it is intended to put men at work as soon as the materials arrive. Among the local people interested are W. H. Doyle and O. M. Allen. It is reported that electrical business generally is good in Kalamazoo.

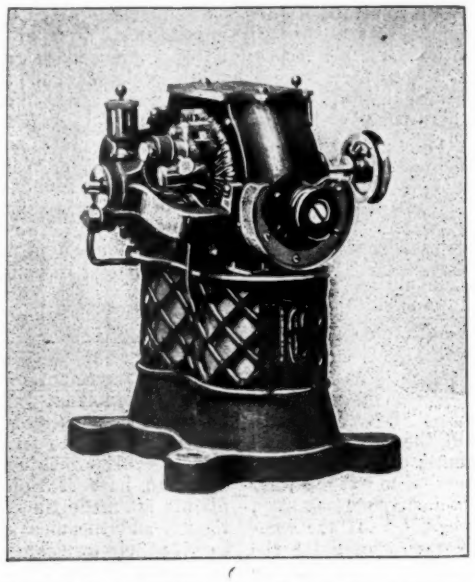

FIG. 2.—HOLTZER CABOT 500-VOLT ONE EIGHTH HORSE-POWER MOTOR.

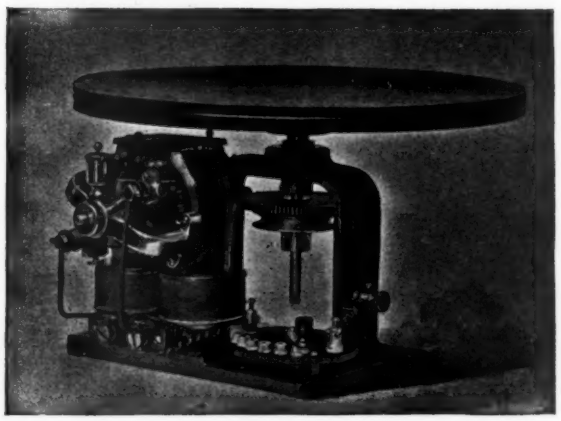

FIG. 3.—HOLTZER-CABOT TURN-TABLE OUTFIT.

The editors of *The London Electrical Review* say that they have personally used and inspected the new Graham telephones, and that no description can do them justice. They believe that the instrument will create a sensation and revolutionize all present systems. The articulation is perfect and the loudness wonderful, no call bell being required, as the talking can be heard plainly all over the room.

A Chicago Elevated Road to be Operated by Electricity.

The West Side Elevated railroad, of Chicago, is to be entirely operated by electricity. The success of the Intramural Electric Railway at the World's Fair, which transported, during the short time the Exposition was opened, not less than 5,803,895 passengers without a single accident and without any serious stoppage, has proved an agitating leaven in the minds of the steam railroad men, only wedded to their steam power until a more economical system can be found. After careful and thorough investigation of every possible system of passenger car propulsion, the president and directors of the West Side road decided that electricity was the most economical system and the great generators and powerful motors are already under construction in the Schenectady shops of the General Electric Company, where those for the Baltimore & Ohio Railroad Company are nearing completion. The company operating this road is the Metropolitan Elevated Railway, of Chicago, the president of which is Mr. R. Summers Heyes, president of the St. Paul and Duluth railroad, chairman of the reorganization committee of the Atchison, Topeka and Santa Fe road and director of the Metropolitan Traction Company, New York.

The West Side road which connects that part of Chicago with the main city transit systems is to be a four track road for a greater part of the way, to allow of an express service. The line will cross the river on a four track way laid upon a draw bridge.

The power is to be generated from four dynamos. Two of these are to be of 2,000 horse-power each and will be counter parts of the huge machine which ran in the Intramural Power House during the Fair. This at that time was the largest ever built, but since four have been installed in Brooklyn, N. Y., and three in Philadelphia, Pa. The two smaller dynamos are to be of 1,000 horse-power.

The electricity will be carried from the power house over the line by means of a "third rail" placed at the outside of each service track. A sliding shoe contact hanging from the truck of each motor car will take up the necessary current for the motors.

The first order covers 55 complete equipments to comprise at first two powerful motors with the necessary controlling apparatus and electrical air pump for the air brakes, and the subsidiary apparatus and appliances. The motors will be to a great extent similar to those used at the Exposition.

Two motors only to each motor car are to be used at present, but eventually two additional motors will be placed on each motor car. With the two-motor motor cars four car trains will be run during the crowded hours of the morning and evening and three car trains during the hours of slack travel at a speed of 13 miles an hour including stops. With the four-motor motor cars the trains will consist of six cars and the speed will be increased to 15 miles an hour.

According to the present indications the electrics should be running on the elevated by the middle of November next.

The significance of the step towards economy in the adoption of electricity as the propulsive power instead of steam will be better understood when it is stated that if the New York Elevated Railroad system had been operated in 1891 by a system similar to that employed on the Intramural railway, instead of by steam, the shareholders would have been richer by over three-quarters of a million dollars.

Harrison Telephone Affairs.

The Harrison International Telephone Construction Company has moved its general offices to the Chamber of Commerce building, Chicago. The general offices of the Harrison International Telephone Company remain at 44 and 46 Wall street, New York. This change was made imperative by the remarkable growth of the company's western business.

We regret to announce the death of the treasurer of the Harrison International Telephone Construction Company, Mr. James E. McElroy, head of the firm of James E. McElroy & Company, who died suddenly on June 30. He will be succeeded by his brother, Mr. Robert L. McElroy, who is also a member of the above named firm and who is the resident partner in Chicago. There will be no other changes in the management of the corporation.

TELEGRAPH EMPLOYEES AS THEY WERE AND NOW ARE.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, DETROIT, JUNE, 1894, BY A. R. SWIFT.

Writing a paper on any given subject seems to me to be quite an undertaking, especially if you do not know anything about the subject; but when asked to write one and no subject given it seems doubly hard. When my friend Adams wrote me asking that I furnish him a paper to be read at this meeting, my first impulse was to say no, but upon reflection made up my mind to undertake it, and began to think what the subject should be. The telegraph, the telephone, and in fact everything electrical has been worn threadbare, and it seemed to me to be more than I cared to undertake to write a paper to be read before you gentlemen on electrical matters, not one of you that does not know more about electrical matters, perhaps, than I do. I then thought how it would do if I compiled a history of my experience during a strike, but that was too long ago to be of any interest. But I will say this: a strike where the men are thoroughly whipped is a good thing. We did not know what good service was until we went through it. During my long service as a telegraph superintendent I have had a good chance to watch the various changes in men, their service, their nature and their actions. Not only have I watched this in my own department, but in other departments of railway service. There used to be years ago a disinterested service, but now how vastly changed. Men toil now for wages, not for honor. Only a few years ago, if a man was employed in a railway or telegraph service he seemed to feel that he was filling an engagement, his heart was in his work to see how well he could please his employer as much as for the profit gained. There was something thought of besides remuneration. An employé thought nothing of working a few hours overtime without adding up the surplus moments and charging for them. Work was well done because his heart was in it. How is it now? This everlasting clamor that employés are overworked, because in the stress of on-rushing traffic demands are heavy and hours long. You will all agree with me that it is almost impossible to get even a civil answer from a majority of employés on a railway train, because he is not paid to do so. When a conductor steps from a train to the platform he stands like a statue, neither looking to the left nor to the right to see if any belated traveler is trying to catch the train, and all because he says he is not paid for such service. When a man steps to the counter in a telegraph office, as a general thing he is treated in a surly manner, and if a respectful answer is given to questions asked, he is surprised. There is no doubt but all trainmen, as well as telegraph employés, meet all kinds of people, and are greatly annoyed by them and their questions, but it pays to be civil. Still there is, since organizations became so numerous, a feeling among their members of a sort of independence that a few years ago did not exist. I do not mean to say that all are so, but I do say it is so with the majority. The trouble is men are too plentiful. Take, for instance, our police. An Irishman is nobody if three weeks after his arrival in this country he is not an alderman or a policeman. And speaking of a policeman reminds me of a story that my friend "Selden" told me: "An Irishman came to this country, and after a residence of only three weeks applied to the Chief of Police for a position. The Chief says: 'How long have you been here?' 'Three weeks, your honor.' 'But that is a very short time.' 'I know it, sur; but me cousin Mike was made one, and he was but two weeks here.' 'Can you read?' 'I can, sur.' Across the street was a saloon sign and one of a Chinese laundryman. 'What does it say on the sign opposite?' 'Saloon, sur.' 'No, not that one, but the next one to that.' Mike stammered for a moment, then says, 'I can't read that one, but if I had me flute with me I could play it.'"

Even our government employés are oftentimes uncivil. A lady steps to the window of the post office and asks for a stamp; it is given her. She asks the employé to put it on her letter, and he in a surly manner says, "Put it on yourself." If she complies does this not necessitate the purchase of another stamp for the letter?

I well remember when I first began the work of an operator. It was at Geneva, N. Y., over thirty years ago. I received the munificent salary of thirty dollars per month. I was proud of my position, my pay was equal to that of most young men, and to be an operator was something to be admired. My regular office hours were from 8:00 A. M. to 8:00 P. M., and these hours seemed easy, but now men are only asked to work about two-thirds of that time. When trains were delayed from any cause, or a message of any importance sent requiring an answer, I thought nothing of waiting sometimes late into the night for it, to see if I might not be wanted for the delayed train. If I was thanked by the interested party I considered myself well paid. The thought that I should be paid for the overtime never entered my mind; but now, when hours are shorter and more men employed to do the same work, not only are those men paid for every moment beyond their regular hours, but a howl is made that they are overworked and must have additional help. Is there any good reason for this? Railway men as a general thing are well paid, and in almost every case the perquisites they receive in the way of free transportation, etc., for themselves, their families, their cousins and their aunts, amount to as much if not more than the moneyed consideration.

I do not wish to be put upon record as being opposed to men's organizing, if it is done for a good purpose, mutual benefit, such as insurance for instance; but I do say this, that telegraph employés should not be bound together by the obligations that all these organizations require. A telegraph operator is in one sense of the word a confidential agent of the officers of the railroad corporation and of the public. He handles the correspondence, to a great extent, between its officers and employés, and is trusted. When he obligates himself, as all organizations require they must do, viz., to help a brother in need, first to inform him of anything that may be against his welfare, no matter whether they are betraying the confidence of their employers or not. The operator is soon promoted to be a dispatcher, if worthy, empowered to handle a certain number of men upon some division. Is it not natural to suppose that through his former obligations to his union the members of his order are favored first, and in many cases (I speak from my personal knowledge) his faults are covered up and his shortcomings overlooked, until through some other source than the head of his department, the railway officials find that he is not a fit man for his place, and his faults have been overlooked because he was a brother member of the same organization as his superior in charge.

In my opinion the best and only way for employés to succeed is upon their own merits. Walking delegates have but little influence upon those in whom rests the power to promote their men. We make no distinction in the employment of men in the telegraph department of our road. We only ask that the company shall receive the service paid for, and do not care to ask whether they belong to a union or not.

In the treatment of men, I have always made it a point when they have come to me after being dismissed by their chief, to investigate their case, and if an injustice has been done, to have it righted. If complaints are made they are also investigated and the men given a chance to give their own side of the matter. There are always two sides to a story, and in many cases I have found the employés side of it was right. Even though they are wrong, they are better satisfied if given a chance to explain, and leave the service with a feeling that they have not been kicked out without a cause or a chance to right themselves. We have adopted an application blank, a copy of which I take pleasure in laying before you, and I would ask your opinion of it. It seems to be an improvement over the old application blank in use so long. It does not in any way prevent your chief operators from employing men in cases of emergency, but it gives the superintendent of telegraph the knowledge at once of who is being employed and a chance to obtain a perfect record of his men, as it is through him that applications are approved or rejected. The service card adopted by our association at our last meeting and of which I claim the honor of originating (if there is any), seem to meet the approval of all, and I hope that our members have not failed to bring new ideas of many matters that may be of interest and that they will lay them before our meeting for general discussion. It is in this way our service can be much improved, and even if the new ideas discussed are not adopted, it sets our members to thinking where they can, perhaps, use a portion of the matter to perfect some idea of their own. An inventor never succeeds with his first invention. He puts before the public a crude machine, and some one who inspects it finds that parts of the machine have been left out which, were they added would have bettered the original idea and he adds them to it. He then becomes the owner of the first man's invention, because he has from inspection found that the parts he adds makes it so much better that the first inventor is lost sight of, and so it is with us. It is the duty of all our members to advance and discuss any and all ideas that may have come to them since our previous meetings. No matter how crude, something good may come from it by discussion.

Electric Railway Improvements in Pennsylvania.

The Car Equipment Company, of Philadelphia, has purchased the controlling interest of the Schuylkill Electric Railway Company, of Pottsville, Pa., and it is their intention to extend the line about 25 miles in and around Pottsville, connecting St. Clair, Middleport, Tremont, Schuylkill Haven and other towns near by with Pottsville.

Jesse Newlin and Robert Alliston have retired from the old board of directors, and W. A. Barritt, Jr., and Charles H. Barritt, president and treasurer, respectively, of the Car Equipment Company, of Philadelphia, have been elected to fill the vacancies. J. B. Stuart, of Philadelphia, has been appointed electrician and general superintendent, and his success in the construction of the Pottstown, Camden and Gloucester roads will assure a perfect system for the roads at Pottsville.

The Schuylkill Electric Railway Company has a capital stock of $150,000, which was raised by popular subscription from the residents of Pottsville and was full paid. The road was originally built out of the capital stock, and the improvements or betterments from time to time were contracted for out of issue of bonds; the road has a bond indebtedness of about $95,000. There would seem to be a sound financial basis to work from in the reorganization and improvement of the road.

The Schuylkill Electric Railway proper consists of 10 miles of road with 18 car equipments, about half of which are new and the remainder consisting of Short apparatus, which will be, no doubt, replaced in the very near future with more modern equipment. New feeder wire will be put in on the entire system to supply sufficient and additional power for the extra car equipment that will be added and a new car barn will be built at Palo Alto. The entire system will be overhauled and will be put in a first-class position as soon as possible.

Northwestern Electrical Association.

The Summer meeting of the Northwestern Electrical Association will be held in St. Paul, Minn., July 18, 19 and 20. There is excellent promise of a large meeting. At the last meeting, held in Milwaukee, 150 were present, and a larger number is expected at this meeting. Representatives from Illinois, Iowa, Michigan, Wisconsin and North and South Dakota, have written that they will be present. An excellent programme has been prepared, and the best expert and electrical talent of the United States has been secured to address the convention. Current will be furnished to illustrate lectures as well as to accommodate exhibitors. Manufacturers and supply houses will be accorded every courtesy by the association.

Silas W. Moore, manager of the Lima, O., Electric Light and Power Company, died recently of neuralgia of the heart.

RESUSCITATION AFTER ELECTRIC SHOCKS.

BY DR. A. D'ARSONVAL, IN LONDON "ELECTRICAL REVIEW."

In my paper of April 4, 1887, I showed that electricity occasions death in two very different manners:

1. By lesion or destruction of the tissues (disruptive and electrolytic effects of the discharge).

2. By excitement of the nerve centers, producing the arrest of respiration and syncope, but without material injuries.

In the former case the death is final; in the latter it is merely apparent. I have proved that it is then possible to resuscitate the victim by means of artificial respiration. I have been able to sum up my numerous experiments in the following practical formula: A man struck by lightning should be treated like one drowned.

Taking my stand on these facts, I have protested against the penalty of death inflicted in America under the (barbarous) name of electrocution, the industrial alternating current employed in this case producing nearly always the second kind of death.

An accident which happened in the last few days—the conditions of which could be ascertained with all the precision of a laboratory experiment—has just confirmed in man what I have seen in the lower animals.

This is an account of the case as communicated to me by MM. Picou and Maurice Leblanc, two well-known electricians, eye-witnesses of the accident, and restorers of the person "electrocuted."

When the accident occurred at St. Denis, the electrometer of Epinay, fixed between two of our three wires, marked 4,500 volts, and the ammeter, inserted in one of them, showed 750 milliamperes.

At the place where the disaster occurred the three wires are supported by a small post fixed to a wall at about six meters above the ground. The man who was struck was astride on the lower connecting bar holding in one hand one of the conductors. He had carried with him a telephone wire which he was about to fix. This wire rested on the connecting bar and touched another of the three conductors.

The current was closed through the man, entering by one hand and escaping in short circuit by one buttock.

He had, therefore, undergone directly the whole tension (4,500 volts, frequency about 55). It is difficult to say exactly how long, but certainly for some minutes. The short circuit which he occasioned led to the production of sparks at the collector of the Epinay apparatus. The agent superintending suspected an accident and telephoned to La Chapelle to stop. All this represents a rather long time.

At this instant we were setting out from Epinay and were already in the train when we were informed that an accident had just happened.

About a quarter of an hour after we arrived at St. Denis; this man was still astride on the connecting bar, and no longer showed any sign of life. It was very difficult to take him down, and this operation took at least half an hour.

Following your advice we practiced artificial respiration (working the arms), but at first without result. I then forced open his mouth and loosened the tongue, when his lungs began to act almost immediately. In two hours he was able to speak. He was burnt at the right hand and on the buttock. To-day he is doing well.

Some days ago they informed me again: "The injured man is doing well. It must be noted that no particular trouble, due to the passage of the current through the body, has been manifested. It is merely needful to attend to the burns."

All comment seems to me superfluous, and I merely repeat in conclusion: A man struck by electricity should be treated as if drowned.

Works of the Whitney Electrical Instrument Company.

The headquarters of this flourishing concern are located at Penacook, N. H., on the banks of a branch of the Contoocook River, from which their motive power is derived, and their works form one of the leading industries of this picturesque little town. The factory proper occupies a frame building three stories in height and 50x100 feet, and aside from being admirably arranged, is completely equipped for the delicate and precise nature of the work in hand.

FIG. 1.—WHITNEY ELECTRICAL INSTRUMENT COMPANY'S CALIBRATING ROOM.

Good light is, of course, an important requisite, and the work rooms are bright and airy, with windows on all four sides. The main machine shop is on the second floor, and here the delicate and finely adjusted parts of the various instruments are turned out, no less than nine special tools of the finest quality being used in this work.

FIG. 2.—WHITNEY ELECTRICAL INSTRUMENT COMPANY'S MACHINE SHOP.

The battery room for testing direct current instruments occupies a portion of this floor and contains 500 cells. These are charged by a 15 volt 400 ampere Eddy motor, built specially for this work. There is also a 500 light Thomson-Houston alternator, for testing alternating current instruments and for lighting the shop. When this machine is in use for calibrating instruments a direct current is switched in for lighting purposes. A store room and wood working department is also located on this floor, and off of these a polishing and plating room.

The calibrating and assembling room occupies a space 50x60 feet on the ground floor, and here the various instruments may be seen in all processes of construction. The instruments calibrated up to 1,000 volts are connected direct to the dynamo, and all the low reading instruments through Stanley transformers.

The Stanley company are now making some special transformers for the Whitney company, through which the current from a primary circuit of 1,000 volts steps up to 5,000 volts. These will be used for calibrating high reading alternate current voltmeters.

The Whitney company are now building a special station instrument for the Concord Land and Water Power Company's three phase system, which is rather out of the ordinary line. This is a voltmeter to go on a primary circuit of 3,000 volts.

The power for running the factory is derived from the river, and is supplied by two 125 horse-power turbine wheels. The driving pulley on the main shaft is seven feet in diameter with a three foot face, and the Page belt running from this to the secondary line of shafting is the largest in Concord. A 30 inch belt runs from the secondary shaft to the line running through the building. A 40 horse-power boiler is located in the power room, but is used for heating purposes only.

The offices are in the front of the building on the main floor, and like the rest of the plant, are bright and pleasant.

Dr. A. H. Hoyt, electrician and general manager of the company, will always be found here, ready to do the honors of the works, and if his visitor happens to be interested in fire-arms, he can show him as fine a little collection as will be found in the State. He knows how to use them, too.

General Electric Direct Connected Generators.

The illustration on the first page of last week's ELECTRICAL REVIEW showed one of the four compact plants which the General Electric Company has recently installed in the Manhattan Life Insurance building, New York. It consists of a six pole, 25 kilowatt, 300 revolution iron-clad generator, connected to the shaft of an Armington & Sims vertical 40 horse-power 9½ x 10 inch engine. The other three consist of 50 kilowatt generators and 80 horse-power engines. These small direct-connected generating sets are now being built in large numbers by the General Electric Company at its Schenectady works, the demand for them having become very urgent. They occupy but comparatively little space, and this feature alone would recommend them highly for all isolated plant or marine work; they are solidly and substantially reliable, and wherever they have been installed have given absolute satisfaction.

Mr. H. C. Graffe, who holds a city office at Fort Wayne, Ind., has resigned the presidency of the local Jenney Electric Lighting Company and will sever his connection with the company. Mr. Graffe did this in order not to complicate the company in renewing its contract to light the city, as the law makes it questionable whether an officer can contract with the municipality.

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Mr. William A. Fraser, city electrician of Dallas, Texas, writes: "Please send me the ELECTRICAL REVIEW and draw on me for the subscription. I recognize your paper as something an electrician or anyone connected with electrical work cannot afford to be without."

Now that the first round of Senatorial "yapping" over the tariff bill has ended, we suppose we must wait till the House gets in its licks before even a patched-up bill can become a law. In the meantime we stand still and contemplate the stagnation of trade, and our only amusements are strikes and anarchistic outbreaks.

TOWN REFUSE AS FUEL FOR ELECTRIC LIGHTING.

It is, perhaps, only in England that the subject of making profitable use of town refuse has received serious consideration. By town refuse is meant the contents of ashpits and dustbins, market and trade refuse and the sweepings of paved streets. The duty of dealing with refuse of this nature practically devolves upon municipalities and other authorities having local administrative powers. The original idea was to dispose of the refuse by burning it. Then it was thought that the waste heat and gases produced by the combustion of the rubbish could be utilized for raising steam in boilers, which would supply steam to engines, which in turn would drive dynamos for electric lighting purposes. This view of the question has, during the past few years, been developed in England, and at the present moment the subject is receiving attention in different parts of the country.

At the same time it may be incidentally mentioned that the Berlin, Germany, municipality has shown some interest in the subject, it being reported that that authority recently appointed a deputation to visit England for the purpose of inspecting the methods there in use of treating town refuse. Apart from this, with the increasing growth in the population of large towns and cities, the question of disposing of town refuse will become more acute and will have to be dealt with in most civilized countries. Bearing this matter in mind, a little information concerning English practice should be of value. Unfortunately the details of the general method there used have been scattered about, and they have only now been collected together by Mr. C. Jones, the engineer to the Ealing Local Board. This information is embodied in a book entitled "Refuse Destructors," and published by the London *Electrical Engineer*.

It may here be stated that refuse destructors are furnaces in which town refuse is burned. Various types of destructors are in use, but the general principle of them is, in brief, the following:

A destructor is composed of a series of what are termed "cells," say six or any larger number. Each cell constitutes a separate furnace consisting of a cavity enclosed by a reverberatory arch lined with fire bricks. The cell is provided with a hearth for the reception of the material to be consumed from which it passes into the furnace proper. The fire bars are placed in a slanting position, so as to promote the passage of the material to the front, and so facilitate the removal of the clinkers. The top of the destructor forms a platform having an opening over each cell into which the refuse to be burned is tipped from the carts that have collected the rubbish. The opening for the entry of the refuse is divided from the opening for the exit of the gases by a wall, and a bridge is built to prevent refuse from getting into the flue immediately below.

One of the objections to the employment of refuse destructors has been the noxious vapors given off in the drying of the refuse in the first stage of burning, and which vapors have passed out of the chimney shaft into the atmosphere to the annoyance of the people living in the neighborhood of the destructor. In order to overcome this difficulty a second furnace, termed a "fume cremator," has been adopted in some towns. This second furnace is arranged between the first furnace and the chimney. By this means the vapor, etc., from the destructor cells is drawn over a bed of incandescent coke, and in so passing is raised to a heat of 1,200° to 1,500° F., this practically completing the partial distillation commenced in the cells, and resolving the empyreumatic vapors into their primitive gases, odorless at last.

As already mentioned, it has been thought that refuse destructors could be employed for electric lighting purposes. In a few cases, as at Salford and in Edinburgh, it has been possible to obtain power from the combustion of the refuse to the extent of supplying two or three hundred incandescent lamps. As a general rule, however, the employment of refuse destructors for this purpose must necessarily be restricted. In this connection it may be interesting to quote one statement by Mr. Jones: "Although there is a certain value which should, of course, be utilized, it would be worse than folly to go in opposition to the ascertained facts which have a practical bearing upon the subject. By all means utilize to the fullest extent all that can be got out of house refuse; but if some of the theories propounded are taken as the basis upon which hopes are to be raised and thousands of pounds expended in the attempt to light large towns with the product of the dustbin, then without a doubt failure will follow the experiment, and when too late corporations will learn that an electric installation, whilst utilizing to the utmost all that can be obtained from the destructor, must be absolutely independent of the same, and rely entirely upon its own completeness."

Mr. Jones' book contains a lot of practical information upon the general subject, and its value is increased by a number of diagrams illustrating different types of destructors. It is the only compilation on the subject, and one which will probably attract much attention.

Interest in incandescent lamp matters is still at a high point. Suits and injunctions are of almost daily occurrence, and every now and then a new non-infringing lamp is announced. It is reported that the General Electric people feel sure that the Edison patent will hold until January, 1897, although if it expires with the Canadian patent it goes out November 1, 1894, but upon that day the Supreme Court will give a hearing upon the question as to whether the Canadian patent fixes a limit for the American patent. The question turns on technical points over which the Supreme Court has never yet passed.

OUR CHICAGO LETTER.

Harry Osborn, in opening a storeroom on Dearborn street, decided to cater largely to the amateur trade, and to carry in stock the many little supplies that amateurs so ardently desire and for which they are always willing to pay spot cash. Mr. Osborn is peculiarly well qualified to take care of this trade, having had a wide experience in building electrical apparatus as well as in installing it.

The financial writer of the Chicago *Tribune* calls attention to the difference in the income of the New York and Chicago Edison companies in the following paragraph:

The percentage of expenses to income as shown by the report of the Chicago Edison Electric Company does not compare favorably with the proportion of expenses of the Edison company of New York. The Chicago company shows expenses of 63 per cent of the total income for the year ending December 31, 1892, and 68 per cent for the 15 months ending March 31, 1894. The Edison Electric Illuminating Company of New York for the first five months of this year shows gross earnings of $586,000 and expenses of $263,000, which makes the expenses but 44 per cent of the gross receipts. There will seem to be an extraordinarily wide difference in the expenses of the two companies doing a similar kind of business. The new plant of the Chicago company will soon be ready for operations, and if it enables business to be done on anything like such an economical basis as the New York company is now doing the profits for stockholders are likely to be sharply increased.

The Co-operative Electric Light Company's application for the listing of its securities has been granted and same will probably be placed on the Stock Exchange. This company was organized under a franchise granted July 2, 1888, with capital of $1,000,000 and shares of $10 each, and an authorized bond issue of $400,000. The plant is at 358 North State street, and the company is supplying current to more than five thousand incandescent lamps, and has several miles of circuits in conduits on Elm, State, Chicago avenue, Rush and Pine streets. The rates of this company are but three-quarters of a cent per hour per light, while the Edison company is charging one cent per hour per light, and the daily papers intimate that the plan is to force the Edison company to buy the plant out. This is denied by the Co-operative company, but unless they can furnish sufficient proof the governing committee of the Stock Exchange may object to the financial listing of the securities as the committee do not care to be placed in the light of promoters. F. De L.

Chicago, July 7.

OBITUARY.

Alderman Frank M. Sweet, of Newark, N. J., died on July 1. He was stricken with paralysis about six months ago. He was born June 2, 1831, in Canandaigua, N. Y., and went to Newark in 1854. He became connected with the Western Electric Company in 1883, and was with that concern until he became incapacitated for work.

PERSONAL.

Hon. John R. Murphy has been appointed Commissioner of Wires for Boston.

Dr. F. P. Vandenbergh, of the Vandenbergh Laboratory of Industrial Chemistry, Buffalo, N. Y., made a pleasant call at the ELECTRICAL REVIEW office last week.

Mr. William A. Fraser has severed his connection with the Dallas Electric Construction Company and has been elected city electrician of Dallas, Texas. Mr. Fraser was elected on the first ballot and received a handsome majority over two competitors.

General Benj. F. Peach, who recently resigned as treasurer of the General Electric Company, has accepted the position of treasurer of the American Stave and Cooperage Company, of Boston. He will also be a director and member of the executive committee.

We are informed that Mr. F. A. Mason, formerly secretary and treasurer of the Interior Conduit and Insulation Company, like all who stray from the flock, is now desirous of returning to his first love, "electricity." Mr. Mason's experience will make him valuable to any electrical concern with which he may become identified.

World's Fair Electricity Building Burned.

An incident of the present labor struggle was the destruction by fire on the night of July 4 of six of the finest buildings at the World's Fair. These were the Terminal Station, which cost nearly $1,000,000; the Manufacturers' Building, which cost $1,800,000, and the Administration, the Electricity, Machinery and Mines and Mining buildings, which in the aggregate cost nearly $2,000,000 more. The fire was of incendiary origin and is credited to the striking railroad men. It is thought that it was part of a plot to get the most of Chicago's fire department out to the World's Fair grounds and then to set fire to buildings in the city which would have been left practically unprotected. The plot failed, as the fire marshal was suspicious and sent only a few engines out to the World's Fair grounds. The destruction of the buildings was complete, and now not a single vestige of beauty of the great Fair remains.

Fort Wayne News.

The restraining order granted by Judge Dawson, of Fort Wayne, Ind., which prevented the stockholders of the Fort Wayne Electric Company from holding their annual meeting on June 9, was made returnable on June 18. At that time the persons on whom the order was served were expected to show cause why it should not be made permanent. When the matter came up on June 18, the hearing was postponed for two weeks at the request of the attorneys for the General Electric Company. The hearing has again been postponed until August 1.

ITEMS OF INTEREST.

During the railroad strike the telephone has been of great value in transmitting orders from Washington to the military commanders at Chicago.

The Thousand Island steamer "St. Lawrence" has been equipped this season with a big electric search-light, and every evening makes a 50 mile ramble among the American and Canadian islands.

A physician usually likes to have two telephones, one in his office and one in his bed-room, so that if a call comes at night he can answer it without leaving his bed-room. A Pittsburgh physician has hit upon a scheme by which he gets the service of two telephones for the price of one. The instrument in his office is hung on hooks and he has made a switchboard to which the 'phone can be readily connected. He has similar connections and hooks on another board in his bed-room. When he goes to bed he unhooks the instrument in his office, puts it under his arm and lugs it up to his bed-room where it is ready for duty all night.

Under the caption, "He Was Full of Electricity," the Boston *Post* and other daily papers printed this drivel:

HACKETTSTOWN, N. J., June 30.—Ernest Ward was dying from an overdose of electricity, but the ingenuity of his aunt has put him on the road to recovery. Ward had been employed at the Edison works in East Newark, where, after receiving several severe shocks, he was carried home in a dying condition. The doctors thought a tumor on his brain had been affected, but Mrs. Annie Bonsy, Ward's aunt, stuck to it that he was full of electricity. A common insulated wire was made bare at the end. One end was connected with a water pipe, and the other end attached to a sponge, which was placed in the patient's hand. The conductor was a perfect one, and while there was no indication to show what amount of electricity passed out of the body, it was noticed that Ward felt a little better after the operation and appeared to be semi-conscious. The experiment was repeated, when Ward became able to talk and could distinguish objects around him. The physicians now attending Ward say he has a good chance for recovery.

Bids For Wire For The Government Library Building.

The new government library building at Washington is to have one of the best electric lighting equipments in the country. It is now being fitted with a complete interior conduit system. The Interior Company's iron armored conduit is used and is being put in by government employés under the supervision of Bernard R. Green, the superintendent and engineer. On July 6 proposals for the wire were opened and the following bids were announced: Royce & Marean, okonite, $3,824.07; John Sullivan (for Roeblings), $4,030.06; General Electric Company, $3,669.45; Safety Insulated Wire and Cable Company, $4,466.50; New York Insulated Wire Company, $4,224.12; Simplex Electrical Company, $3,318.73; American Electrical Works, $6,005.34; Western Electric Company, Habirshaw insulation, $5,075.25, okonite insulation, $5,476.40, safety insulation, $4,462.50; Wm. R. Brixey, kerite, $4,-23.55; National India Rubber Company, $3,559.95; Kennedy & Du Peron, Paranite, $4,-870.81; Bishop Gutta Percha Company, $4,030.

BELL COMPANY GETS ITS INCREASE OF CAPITAL.

A SECOND BILL SUBMITTED WHICH PASSES THE HOUSE AND IS SIGNED BY THE GOVERNOR.

A Bell Telephone Company bill was presented to the Massachusetts Legislature on June 30 asking for an increase of capital stock to $30,000,000, the new stock to be sold at auction. The provisions of the bill are identical with those of the Richardson bill presented by a minority of the Committee on Mercantile Affairs. The Bell company was willing to meet the objections raised to the bill which were vetoed the other day, by agreeing to the sale of the proposed issue of new stock at public auction in case the stockholders do not choose to take it at market value. The rules were suspended by both branches of the legislature in concurrence, and the petition referred to the Committee on Mercantile Affairs, which promptly reported it back, unanimously recommending its passage. Governor Greenhalge signed the bill the same day.

Wall Street and the Electrical Stock Market.

The extraordinary feature of this week's stock market has been its surprising strength in spite of the riots in the West. There was no weakness in the general market until to-day. The bond market, although dull, has been continuously firm.

General Electric scored a small gain for the week, closing at 36¼ as against 35⅞ last Saturday. The highest point reached during the week was 37⅛ and the lowest 35⅝.

Western Union lost a half point, closing at 83 as compared with 83½ a week ago. It reached 83¾ during the week.

The closing quotations of electric stocks on the Boston exchange to-day were:

	Bid.	Asked.
Edison Electric Illuminating	117	...
General Electric	..	36¼
General Electric, pf	65	67
Westinghouse Electric	34¾	36
Westinghouse Electric, pf	50¾	51¼
Fort Wayne Electric	1¾	2

New York, July 7.

A New Atlantic Cable.

The cable steamer "Faraday" anchored off the Port of Canso, N. S., at four o'clock on July 4, having completed the third Atlantic cable for the Commercial Cable Company. The new cable is of the heaviest type with the largest copper conductor and the speediest ever laid for the length. The contractors, Messrs. Siemens Brothers & Company, guaranteed it to be 33 per cent faster than either of the two cables laid in 1884 for the Commercial Cable Company, and the tests now being taken show that the speed is greater than the guarantee. The "Faraday" has broken the record in Atlantic cable laying, the actual time engaged in the operations being 20 days.

The General Electric Company, it is understood, has created quite a demand for power motors among shoe manufacturers, owing to the prevailing disposition to save on labor and other details wherever practical.

MACHINE CURRENTS AND RAILROAD TELEGRAPH LINES.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, DETROIT, JUNE, 1894, BY J. W. LATTIG.

For such a valuable adjunct to the telegraph, it is surprising how little has been said and written in relation to the use of machine currents for telegraph lines, and it is even more surprising how slowly the system has been adopted. The writer was never more impressed with this fact than when he came to write about the subject.

There are, doubtless, books containing treatises on the subject, but I have been unable to discover them. I have, however, a recollection of having seen articles in some of the electrical journals, but with the single exception of the *Electrical Engineer* of January 27, 1892, was unable to lay hands upon any of them. In the *Electrical Engineer* of the above date I found an article by Mr. A. S. Brown, electrical engineer of the Western Union Telegraph Company, to whom, personally, I am also indebted for other interesting data upon the subject.

The first regular installation of the sort was put in operation in this country by the Western Union Telegraph Company in their New York building only a comparatively few years ago, viz., in the Summer of 1880, and the first person to apply or suggest machine currents for telegraph purposes is believed to be Mr. S. D. Field, who operated some Western Union wires in California a year or two prior to 1880. At the time of the introduction of the dynamos the Western Union Telegraph Company were enabled to dispense with 45,000 cells of battery and reclaim about 15,000 square feet of valuable room, which has since been money producing space. Such space would make forty offices 20x20 feet square, which, at the extremely low figure of $15.00 per month for one office, would amount to over $100,000 for the fourteen years which have elapsed since the service began.

Nor is this all. There are now operated from 195 about 1,100 lines, exclusive of branch office loops, etc., which to operate with battery power would require more than 100,000 cells and would occupy about 25,000 square feet of floor space, so that outside of the immense advantages gained in the working of the lines and the cost of the maintenance involved, this space could simply not now be spared.

In addition to the main lines, which are fed by these machine, there are a about 1,000 sounders in 195, all supplied by machine currents. These sounders are specially wound, the winding being adapted to the potential employed. The ordinary local sounders are of 30 ohms resistance, and the potential six volts. The current is, therefore, about two-tenths of an ampere in each, or about the same as is used with ordinary six ohm sounders with two jars of gravity.

The potentials on the lines vary from 45 to 350 volts. Lines of unequal resistance are sometimes made uniform by the use of resistance coils; but this is rarely necessary with this plant, for the reason, as before stated, that they have from 45 to 350 volts, divided as follows: 45, 80, 150, 250 and 350, and place the various grades of resistance lines together on suitable potentials.

They are operating at present 53 machines on telegraph service and the maximum number of lines operated from one machine is about 300. The resistance of the machine in such cases is, as it must be, practically nothing to admit of such service. These machines are of Edison and Crocker-Wheeler build.

Where machine currents are used for telegraph lines, it is always necessary to insert one or more incandescent lamps in each circuit, the number or kind depending upon the potential employed on each particular line, in order to prevent possible fire, or damage to the machine in case a line becomes grounded close by, in which event, without the lamp, the current might reach a dangerously large quantity. Some idea of the magnitude of this plant may be conceived when it is stated that about 2,100 of these lamps are in use over the switches at 195.

These lamps are specially designed for the purpose for which they are used. Those used on the lowest potential have a single filament, measuring when cold 140 ohms. The next grade have two filaments in series, measuring 280 ohms, and the highest potential lamps have three filaments in series, measuring 400 ohms. These lamps serve a valuable purpose in addition to serving as resistances and protection for the machines, as when a line is grounded or short circuited, it calls immediate attention of the testing operator to the fact that the circuit to which such lamps may be connected is grounded or otherwise deranged, without waiting for a report from some other operator or office.

It is, perhaps, useless to multiply words in any further effort to illustrate the usefulness of the system. It is sufficient to call attention to the fact that the Western Union company have recently equipped their Buffalo office and some of their other larger offices, and the Postal-Telegraph Cable Company have introduced it in their handsome and thoroughly equipped New York building; but, before I leave this portion of the subject, I will quote from Mr. Brown's article a few sentences, indicating beyond a doubt the status of the system in the estimation of his company. He says: "At the date of the fire in 1890 the office contained about 10,000 cells, nearly the whole of the sixth floor of the old building being occupied by the cells. The great superiority of the dynamos over the batteries in efficiency of service, low cost of maintenance and saving of room has been abundantly demonstrated, and it was determined that in the reconstructed office dynamo currents should replace all others. So thoroughly has this plan been carried out that not a single cell of battery now remains in the building."

Some of our friends say, "Yes, it is all very fine, but it is beyond our reach," and like the fox in the fable be inclined to cry, "Sour grapes." I can sympathize with such having experienced the feeling.

Almost from the beginning the company with which the writer is connected batteried one of their wires from these Western Union machines. It was a comfort to work on that wire, but it only served to aggravate the discomforts of working on the others, and as a consequence there was many a longing for the same source of current. These were hopes which were at that time apparently futile, and we turned away sadly after searching every nook and corner of our minds in a vain effort to discover some means within our financial ability by which we could install such plants, where the necessities were not so great, without being obliged to maintain steam plants and dynamos for this specific service, recognizing that to assume such an undertaking for a comparatively few wires would never pay financially—the test we are all obliged to stand by—and for that reason would not be approved by our superior officers.

It must be remembered, however, that these were early days in the history of machine telegraph currents. Later the writer quit for several years the telegraph field. The march of improvement went on in that direction, as well as in every other department of applied electrics, and upon his return one of the first improvements noted was the recent development in this particular field. What was merely almost a hopeless wish before was then an established and successful reality; what was before within the reach of only large telegraph centers was then so advanced as to have actually become a means of economy, even where less than a dozen lines were to be fed.

The hope has now been realized; the problem solved. The system is in service on several roads at this time, with the most satisfactory results as to the working of lines so equipped, and, moreover, is available to perhaps every railroad in the United States for at least some of its wires.

The invention of the transformer, known sometimes as the motor dynamo, is the instrumentality by which this desirable improvement has become an established fact. It can be applied wherever there is a source of direct current supply to run a motor, which is the case in nearly every town of any consequence in the country, if, indeed, it cannot soon be available where the service is alternating, although the writer has up to this time been unable to find an alternating current motor of one-fourth horse-power which is sufficiently economical to warrant its application upon that score alone; in fact, he has been unable to find any motor at all of that capacity, but has tried several alternating current motors of one-eighth horse-power, to the shaft of which he has attempted to couple directly, and also by single reduction, a small one-sixth horse-power motor, the latter being run as a dynamo, but was with much regret obliged to suspend experiments pending the finding of a quarter horse-power alternating current motor, the one-eighth horse-power alternating current motor proving inadequate for the service; that is to say, the motor which was to be employed as a generator required a speed of 1,600 revolutions per minute to generate 110 volts and one and three-quarter amperes of current. The alternating current motor was for a 50 volt circuit, with a speed of 2,400, consuming four amperes when running at speed. It was found, however, that but about 90 volts could be produced in a dynamo without slowing down the alternating current motor to such a degree that it heated beyond a point of safety. There is, no doubt, a time coming, and that shortly, when a motor dynamo, with the motor or primary side alternating current, and the dynamo or secondary side direct current, will be available for such service. It can be confidently said when this time arrives machine currents will be within economical reach of every railroad in every city, and also in all of the larger towns throughout the country.

Speaking for the writer's own employer, the Lehigh Valley Railroad, he can say that there are at the present time three battery centers at which machine currents will be applied the very moment that direct currents or an alternating current direct connected transformer is available.

To be more specific, for the benefit of those of our members who may not be familiar with these transformers, I will say that the motor dynamo or transformer is a machine with two independent windings and with four brushes. The primary side, with its winding and brushes, is a motor, and may, of course, be so wound as to be driven by currents of any available voltage. The secondary, with its winding and brushes, is a dynamo, and may be so wound as to generate currents of higher or lower voltage than that delivered at the brushes on the motor side, and the current it delivers may be greater or less than that which drives the motor; hence, it is said to be a transformer. They do not transform the original current, but generate a new current, which is as entirely independent of the primary current which drives the machine as is the current on one line which is being operated by a repeating instrument from another line. It must not be understood that there is no loss in the transformation; there is, and it is in the smaller sizes of transformers of this kind considerable, probably 50 per cent or more; but notwithstanding this loss the cost of generating electricity chemically is so great that there is economy in feeding wires from these transformers, even where a comparatively few wires are employed, and current costs as much as one and one-quarter cents per ampere hour.

Through the courtesy of Superintendent Adams, of the Philadelphia & Reading, I recently had the pleasure of inspecting their magnificent terminal in the city of Philadelphia, at which point he has equipped their telegraph lines with machine current. They have 31 wires with 100 volts negative polarity and 32 lines with 80 volts positive polarity, 55 sounders run to 50 ohms each, two sets of duplex 25 ohms each, and one set of Milliken-Hicks repeaters. The current on his lines varies from 25 to 60 milliamperes per wire, but he makes an effort to hold them as near 40 as possible. Mr. Adams informs me that 40 milliamperes seem to furnish the most satisfactory results, and my own experience agrees with his views.

For this service he has three Crocker-Wheeler motor dynamos, which are run by current supplied from their splendid plant in the building. One of the converters is an 80 volt machine of six and one-half ampere capacity and the other is a 100 volt machine of eight and one-half ampere capacity. The machine on the sounder circuit is a six volt machine, of 13 ampere capacity. Each sounder circuit is provided with a separate cut-out, so that a short circuit at the relay, or sounder posts, would blow its own fuse only and there would be no interference with the balance of the sounders on that particular table. The sounders themselves are provided with insulated binding posts, to prevent an accidental or intentional short circuit of this kind. The switchboard has the usual equipment of lamps, is neatly fitted and fully provided with fusible cut-outs of the W. B. G. type fusing at, I think, one ampere, the whole making, perhaps, one of the neatest railroad equipments in this line to be found anywhere.

(To be concluded.)

REACTANCE.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, MAY 18, 1894, BY CHARLES PROTEUS STEINMETZ AND FREDERICK BEDELL.

The term "reactance," which has been used and advocated by the writers and others and which has been officially adopted at our suggestion by the American Institute of Electrical Engineers at its Philadelphia meeting, is one which assumes particular importance now that the term "inductance" is defined as synonymous with the "coefficient of self-induction," usually symbolized by the letter "L." Reactance is a quantity similar in many respects to resistance, but the electro-motive force used in overcoming reactance consumes no power, for it is at right angles to the current.

The impressed electro-motive force in an alternating current circuit may be divided into two components: First, the power electro-motive force in the direction of the current and, second, the reactive electro-motive force in quadrature with the current to overcome the reactance. The reactive electro-motive force is the product of the current and the reactance. The reactance is, accordingly, equal to the component of the impressed electro-motive force at right angles to the current, divided by the current. Reactance is measured in ohms.

The reactive electro-motive force in the circuit may be due to self or mutual induction, to capacity or to some outside counter electro-motive force produced by a motor or other device. In general, in any alternating current circuit,

$$\text{Impressed E. M. F.} = \sqrt{\text{Power E. M. F.}^2 + \text{Reactive E. M. F.}^2};$$

that is, the impressed electro-motive force is the vector sum of the electro-motive force which transmits power and the reactive electro-motive force.

Reactance tends to cause a phase difference between current and electro-motive force. If θ represents this angle of phase, we have the relation,

$$\tan\theta = -\frac{\text{reactance}}{\text{resistance}}.$$

When θ is negative, the current lags behind the electro-motive force; when θ is positive, the current is in advance of the electro-motive force. The expression for the instantaneous value of the current may be written,

$$i = I\sin(\omega t + \theta).$$

or

$$i = \frac{\text{Impressed E. M. F.}}{\text{Impedance}} \sin\left\{\omega t - \text{arc tan}\,\frac{\text{reactance}}{\text{resistance}}\right\}.$$

A few illustrations of particular cases will make the use of the term reactance more clear.

CIRCUITS CONTAINING RESISTANCE AND INDUCTANCE.

In a simple circuit containing resistance and inductance, the reactance is equal to $L\omega$; that is, it is 2π times the product of the inductance and frequency. The impedance being the vector sum of the resistance and reactance, is

$$\text{Impedance} = \sqrt{R^2 + L^2\omega^2},$$

where $\omega = 2\pi \times$ frequency. In this case all the power is used in overcoming resistance, and the power electro-motive force is equal to the ohmic electro-motive force RI. The reactive electro-motive force is equal to the inductive electro-motive force $L\omega I$; hence

$$\text{Impressed E. M. F.} = \sqrt{\text{Power E. M. F.}^2 + \text{Reactive E. M. F.}^2};$$

or

$$\text{Impressed E. M. F.} = \sqrt{\text{Ohmic E. M. F.}^2 + \text{Inductive E. M. F.}^2}.$$

The impressed electro-motive force in this case is the vector sum of the electro-motive forces necessary to overcome resistance and inductance.

A consideration of Figs. 1 and 2 (in which positive direction is counter clockwise) will show that the reactance and reactive electro-motive force are positive in the case of a circuit containing inductance. The impressed electro-motive force, which is the sum of the two, is, therefore, in advance of the current, which is in the same direction as the power or ohmic electro-motive force. The current is indicated by a closed arrow in the figures. The same, however, may be otherwise expressed if we take the impressed electro-motive force as our direction of reference, by saying that the current lags behind the electro-motive force by the angle θ, which angle is negative, therefore, for circuits with inductance according to the relation

$$\tan\theta = -\frac{\text{reactance}}{\text{resistance}} = -\frac{L\omega}{R}$$

The value of the current at any instant is given by the equation

$$i = \frac{E}{\sqrt{R^2 + L^2\omega^2}} \sin\left(\omega t - \text{arc tan}\,\frac{L\omega}{R}\right).$$

CIRCUITS CONTAINING RESISTANCE AND CAPACITY.

In such circuits the reactance is equal to $-\frac{1}{C\omega}$, where C, capacity, and $\omega = 2\pi \times$ frequency, that is, it is negative. The reactive electro-motive force is also negative, being equal to $-\frac{I}{C\omega}$. This negative reactance gives a positive value to the angle θ, and the current is accordingly in advance of the electro-motive force. We have then

$$\text{Impedance} = \sqrt{R^2 + \frac{1}{C^2\omega^2}},$$

and

$$\tan\theta = -\frac{\text{reactance}}{\text{resistance}} = +\frac{1}{CR\omega},$$

similar to the corresponding equations above. The instantaneous value of the current is given by the equation

$$i = \frac{E}{\sqrt{R^2 + \frac{1}{C^2\omega^2}}} \sin\left(\omega t + \text{arc tan}\,\frac{1}{CR\omega}\right).$$

These relations are shown in Figs. 3 and 4.

CIRCUITS CONTAINING RESISTANCE, INDUCTANCE AND CAPACITY.

In a circuit containing inductance and capacity the reactive electro-motive force is the sum of the inductive electro-motive force and the condenser electro-motive force; that is, $L\omega I - \frac{I}{C\omega}$. The reactance is similarly the sum of two terms, $L\omega - \frac{1}{C\omega}$; thus, the reactance is positive or negative, according to whether the inductive electro-motive force is greater or less than the condenser electro-motive force. Whether the current is behind or ahead of the impressed electro-motive force depends upon the same condition, for

$$\tan\theta = -\frac{\text{reactance}}{\text{resistance}} = \frac{1}{CR\omega} - \frac{L\omega}{R}.$$

The value of the current at any instant is

$$i = \frac{E}{\sqrt{R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2}} \sin\left\{\omega t + \text{arc tan}\left(\frac{1}{CR\omega} - \frac{L\omega}{R}\right)\right\}.$$

The diagrams in Figs. 5 and 6 illustrate the case of a single circuit containing resistance, inductance and capacity. In the case here represented, the condenser electro-motive force is greater than the inductive electro-motive force, and the current is therefore in advance.

CIRCUITS CONTAINING MUTUAL INDUCTION.

To further exemplify the use of the term reactance, let us consider a circuit containing a transformer. Besides the electro-motive forces already discussed, we must consider the back electro-motive force due to the influence of the secondary upon the primary circuit. This may be resolved into two components, one in the same direction as the current, and the other in quadrature with it, which will form part of the power electro-motive and reactive electro-motive forces respectively. The electro-motive force introduced by a motor is treated in the same way.

These illustrations will suffice to show the method by which any electro-motive force in a circuit is resolved into two components, one in the direction of the current, which, therefore, transmits power, and the other at right angles to the current, which represents no power, but simply overcomes the reactance.

It is to be borne in mind that the terms here given may be used in all alternating current circuits, whether the current it harmonic or not; for, when the current is not strictly harmonic, we may consider it equivalent to an harmonic current. The equivalent harmonic current and equivalent harmonic electro-motive force have the same square root of mean square values as the actual current and electro-motive force, and have such relative phase positions that the same power is transmitted.

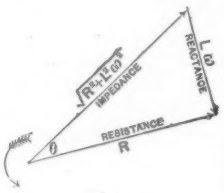

Fig. 1.

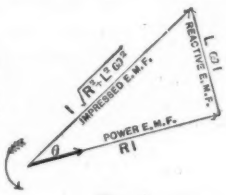

Fig. 2.

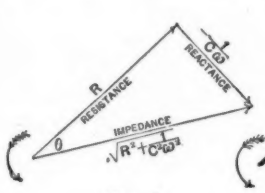

Fig. 3.

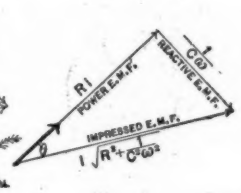

Fig. 4.

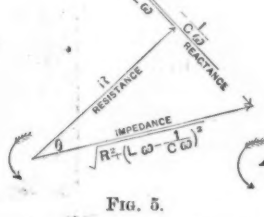

Fig. 5.

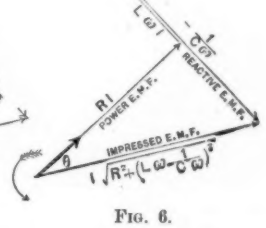

Fig. 6.

OUR WESTERN LETTER.

Mr. H. P. Broughton, of St. Louis, was in Chicago last week installing some equipments for the Royal Arc Electric Company. Referring to contracting business, Mr. Broughton states that his firm, James I. Ayer & Company, have had a very busy season and are looking forward to a decided increase in business.

Mr. Will S. Hine, 307 Dearborn street, Chicago, will send diagrams showing proper connections for ordinary local service for two phase alternating current motors, for incandescent lights, arc lights, etc.; also on long-distance circuits where high voltage generators and step-up and step-down transformers are used. A long-distance wiring table will also be sent.

The Union Brass Manufacturing Company, corner of Ontario and Franklin streets, Chicago, the outcome of the consolidation of the Chicago Nickel Works, the Reinmann company and the Mosher Electric Company, is now in full working order and prepared to execute orders for all lines of hardware specialties, as well as for the Mosher hot wire arc lamp for alternating and constant potential circuits. Mr. Adolph Weinberg, late treasurer of the Adams & Westlake Company, is the president of the new company and impresses every one most favorably.

The gathering at St. Paul to attend the Summer meeting of the Northwestern Electrical Association will probably include 150 delegates and guests, as a determined effort is being made by Secretary Thom to have this the best meeting yet held. The Hotel Ryan will be the headquarters and ample arrangements are being perfected to take care of supply men. The Chicago delegation may go in a special sleeper over the Chicago and Northwestern Railway. Eastern parties desiring lower berths reserved can secure them by addressing a note to the Western office of the ELECTRICAL REVIEW.

Postmaster Hesing and the street railway lines have been holding conferences relative to the introduction of a postal service that will utilize the street railways for carrying local mails. Until estimates are prepared showing the probable amount of matter the three street railway companies will be required to haul no definite plans will be decided upon. The plans outlined contemplate some arrangement whereby street cars may be provided with proper receptacles for mail pouches, so that mails for city delivery or mails for shipment from the main office may be rapidly transferred from or to the center of the city without the delay at present incident on wagon deliveries and transfers.

F. DE L.

Chicago, July 7.

ELECTRIC LIGHT FLASHES.

R. W. Frost and Guy Cunningham have been appointed receivers of the Woburn, Mass., Electric Light Company in $10,000 bonds each.

Strick McKeon and son Hal are laying brick on the electric light station at Bradford.—*Greenville, O., Tribune.* What's the matter? Afraid a cyclone will grab the station?

Judge Lacombe has granted an order allowing Henry C. Adams, as receiver, to sell the property of the Newtown, L. I., Electric Light and Power Company for the benefit of creditors. The upset price was fixed at $1,200.

A receiver has been appointed for the Citizens' Electric Light and Power Company, of East Liverpool, Ohio. The principal claim is for $5,000, held by the Fort Wayne Electric Company. Liabilities are about $9,000. The property will be sold by the sheriff.

The plant of the Phoenix, Ariz., Light and Power Company has been sold to Mr. J. D. Mallory for $3,500. The machinery purchased by the old company was levied on by the General Electric Company. The new company purchased what was necessary to continue to operate the plant and lights and power will be furnished as usual.

Within a week 600 feet of insulated copper feed wire have been stolen from the power station of the North Attleboro, Mass., Steam and Electric Company, at Farmer's Village. Some days ago the police were notified that a generator was missing, and in investigating this case the loss of the feed wire was discovered. The generator has been recovered, in a barn some distance from the power station. There is no clue to the thieves.

The Louisville, Ky., board of public works has issued an order that the electric light globes are not to be painted in the future and that each lamp shall be permitted to give its full light. Heretofore, at the request of some people into whose houses the lights shine, the electric light company has painted spots on the globes, but the people will have to put up with the inconvenience in the future.

John H. Reckord has contracted with the town commissioners of Belair, Md., to furnish forty 32 candlepower incandescent lights for the town for $ 00 a year. The lights are to be ready by October 1. The Archer & Howard saw mill, on Winters' Run near Belair, which Mr. Reckord has purchased, will be fitted up so as to generate sufficient current to run the lights and also to run the flouring mill in Belair.

The city of Newport, Ky., had a big judgment rendered against the municipality recently. It was the case of the Suburban Electric Illuminating, Heating and Power Company to recover $28,846 for light furnished the city in illuminating the public streets and places. Special Judge James A. Wright gave judgment for the full amount asked for. The case will be taken to the Court of Appeals and the protracted light war that has been the bane of Newport for several years threatens to continue for several more.

The Columbia Telephone Set.

Messrs. H. H. Eldred and James W. McDonough, well-known pioneers in telephone work, have developed and patented a new telephone system, a portion of which is shown in the accompanying illustration. These patents as well as others have been acquired by the Columbia Telephone Manufacturing Company, 138 Front street, New York city, which is placing the apparatus on the market in a very business-like way. A multiple contact carbon transmitter is used in the instrument shown herewith. This transmitter is formed of a series of

THE COLUMBIA TELEPHONE SET.

pencils resting in bearings and having their points rose-shaped, affording a number of sharp contacts. A thin wooden diaphragm is used and to the under side of this the carbons are attached. The receiver, when not in use, is suspended on a hook at the top of which a switch is placed. When the receiver is suspended on the hook a bell rings, and continues ringing until the switch is thrown, cutting out the battery. The Columbia Telephone Manufacturing Company will soon bring out a simple and ingenious automatic telephone exchange system.

LITERARY.

The unpublished letters of J. R. Lowell, written to Edgar Poe during the years 1842 to 1844, to appear in *Scribner's Magazine* for August, will prove more interesting than most of such correspondence, not only on account of the information they give concerning the early literary interests and ambitions of these two famous authors, but especially for their perfect frankness and revelation of the cordial personal relations that marked Lowell's young admiration for Poe, before the days of "The Fable for Critics." They are peculiarly full of the charm of outspoken friendliness and sympathetic appreciation for a brother artist.

"American Street Railway Investments, a supplement to the Street Railway Journal, published annually for the use of bankers, brokers, capitalists, investors and street railway companies." The Street Railway Publishing Company, New York. 216 pages, including 24 maps. Cloth, price $5. Supplied by ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York.

The need of a careful and authoritative compilation of the capitalization and other statistics of the street railway companies of this country has long been felt. This need has become intensified during the last few years by the general employment of mechanical in place of animal power. This has called for a large amount of capital, with the result of greatly broadening the market for this class of securities. The stocks and bonds of many street railway companies now hold equal rank in money markets with those of the leading steam railways, and as their merits become better known they will gain in favor with investors and become favorite securities on the principal exchanges. "American Street Railway Investments" is the first publication giving, in a comprehensive and systematic manner, data regarding the operation and management of the different properties, which will enable dealers and investors to judge of the relative merits of the securities described.

"Houston & Kennelly's Electrical Engineering Leaflets." Price, 10 cents each or $3 for each series of 35 leaflets. Supplied by the ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York.

The *Electrical Engineer* has begun the publication of a series of electrical engineering leaflets by Prof. E. J. Houston and Mr. A. E. Kennelly, containing the underlying principles of electricity and magnetism. They are in three grades, elementary, intermediate and advanced. The elementary grade is suited to electrical artisans, wiremen and elementary students; the intermediate grade is for students in high schools, or colleges, and those beginning the study of electrical engineering; and the advanced grade is for students taking technical courses in electrical engineering. There is a growing desire on the part of students throughout the country to take up the study of electrical engineering, a subject of daily increasing practical importance and prominence. Facilities for its proper study are, however, noticeably limited even in the neighborhood of large cities, and but comparatively few students have enjoyed the requisite preparatory training for such study. The authors believe that these obstacles to a more widespread study will be in a large measure removed by the publication of a series of inexpensive leaflets, in three grades, giving in a reliable and authoritative manner the principles of electrical engineering. Though the three grades of leaflets devoted to the same subject are in supplementary sequence as regards treatment and detail, each grade being a preliminary to the study of the next higher grade, yet, to avoid the danger of confusing students with methods and demonstrations beyond their acquirements, each grade has been designed as a complete course in itself. The leaflets of each grade will be issued in 35 weekly parts, that is to say, there will be three leaflets each week—elementary, intermediate and advanced—for a period of 35 weeks. Each leaflet will consist of eight pages, of small octavo size, and the whole will be illustrated by diagrams and drawings, intended for elucidation of the text rather than for pictorial effect. The publication of these leaflets has just begun and anyone desiring to acquire the full benefit of any or all the courses should subscribe at once. The price of the leaflets is 10 cents each or $3 for each series of 35 issues.

Underground Railway Systems.

TO THE EDITOR OF ELECTRICAL REVIEW:

Commenting on the public letter of Mr. Victor M. Berthold in the ELECTRICAL REVIEW for May 16, 1894, "A Question About the Siemens & Halske Conduit System," I would like to say that representing as I do a most practical conduit system for large cities, I would like to be heard in this matter. Why the Buda Pesth system should stand the best chance for adoption by the Metropolitan Traction Company, of New York, regardless of nonfeasance, is somewhat incomprehensible. "Bought wit is the best wit;" the Metropolitan company may find this old proverb true, though perhaps there may be "a nigger in the wood pile" which ultimately will cause the "powers that be" to relent and allow the adoption of the overhead system.

If Mr. V. M. Berthold will again refer to the ELECTRICAL REVIEW of July 29, 1893, page 287, and note the system therein described, it may greatly increase his non-acquiescence. Though analogous to the often mentioned Buda Pesth installations, the superiority of construction is pre-eminent. This conduit construction, the one conduit in the crown of the street for both tracks, three feet wide by four feet deep is amply large for ordinary purposes, and can be constructed to meet all requirements and emergencies. For a comparison and argument its approximate cost, by Mr. C. R. Weaver, civil engineer, will be:

Per yoke, 223 pounds (3 feet apart), per foot @ 2 cents per pound	$1.48
Covering plates, 60 pounds per foot @ 2 cents per pound	1.20
Slot rails, 26 pounds per foot @ 4 cents per pound	1.04
$\frac{50}{100}$ cubic yards excavation @ 50 cents.	.25
$\frac{16}{100}$ cubic yards brick work @ $9	1.44
$\frac{5}{100}$ cubic yards concrete @ $5	25
Cost of conduit for a double track road per foot	$5.66

One foot of conduit for a double track road is equal to two feet of conduit for a single track road, or; one foot conduit for single track road is equal to one-half of $5.66, or $2.83; 5,280 feet per mile @ $2 83 = $14,943 per mile conduit construction.

The above estimate of cost (which was made during July, 1893), is in advance of the present market prices, which leaves a margin of 10 per cent for incidental expenditures.

Very respectfully,

A. H. HEATZMAN.

Baltimore, July 1.

Iron Armored Insulating Conduit.

Few improvements have elicited warmer commendation in the field of electric wiring than the recent addition of iron armored insulating conduit to its long list of apparatus, by the interior Conduit and Insulation Company. The interior conduit system has from the first enjoyed a unique reputation for its flexibility, but it has now included in its materials those which are not only flexible, but indestructible and imperishable. The notable tendency in architecture of late years has been towards larger proportions and the use of the most substantial materials obtainable; and in keeping with the new steel internal structure, the iron conduit is found of the utmost utility and value, and electric wiring, whether in the main conductors or the smallest branches, has been brought to a remarkable degree of perfection.

As in the case of the brass armored conduit, the Interior Conduit and Insulation Company are also the pioneers with insulating iron armored conduit. The latter consists essentially of the company's well-known plain insulating tubing placed within a heavy wall of lap-seamed wrought iron pipe, which thus furnishes an armor one-eight inch in thickness. The intimacy of the union between the inner tube and its iron wall is said to be perfect; they are, in fact, so firmly consolidated and welded together that one seems to be a part of the other, and yet each is integral.

The flexibility of the system is maintained by the use of iron armored insulating junction boxes, elbows, couplings, etc. This conduit possesses all the qualities of gas or water pipe, and by means of the tools furnished for cutting, threading, etc., can be installed with equal ease. It is at once so simple and durable that it can be used under concrete, tiled or mosaic floors, etc., without the precautions necessary with plain or brass armored conduit; and at the same time, a great saving in labor is due to the fact that it can be installed at an early stage in the construction of a new building, without anxiety as to the rough usage it may have to sustain.

We herewith illustrate some of the features of the iron armored insulating conduit. Fig. 1 shows the actual size of three-eighth inch (inside diameter) iron conduit. Fig. 2 shows a coupling one-half size three-eighth inch. The threads are all straight, so that the ends of lengths, etc., shall abut in the center of the coupling, thus maintaining a continuous insulation. Fig. 3 shows a continuous insulating nipple, and Fig. 4 shows its application to a junction box and illustrates how the continuity of the insulation of the system can be maintained, if the tube should be too short by inaccuracy of measurement. The nipples can also be applied throughout the system to correct slight mismeasurements.

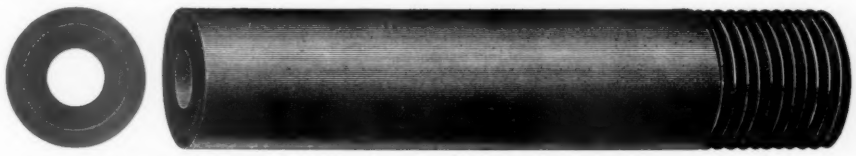

FIG. 1.—INTERIOR CONDUIT & INSULATION COMPANY'S IRON ARMORED INSULATING CONDUIT.

FIG. 2.—COUPLING FOR IRON ARMORED CONDUIT.

FIG. 3.—CONTINUOUS INSULATING NIPPLE FOR IRON ARMORED CONDUIT.

FIG. 4.—APPLICATION OF INSULATING NIPPLE TO JUNCTION BOX.

GENERAL NOTES.

The matter of establishing an electric light plant at Hillsborough Bridge, N. H., is being agitated.

The Camden, N. J., council has ratified a five year contract with the Camden Lighting and Heating Company to light the streets with electricity.

The Mount Holly, N. J., Electric Light Company has received an offer for the purchase of its extensive plant from the Mount Holly Land Improvement Company, which has control of a valuable water power.

Professor Dolbear, of Tufts College, in a recent lecture before the Manchester, N. H., Electric Club, announced that electricity was not in its infancy. This is official and the daily press will please take notice.

The artesian well sunk by an electric light company at Cincinnati is giving the residents in the vicinity considerable annoyance. It seems that the gases escaping with the water are noxious and also have the effect of tarnishing silver and bright work in the neighborhood.

ELECTRIC RAILWAY AND POWER NOTES.

The street railway at Keokuk, Ia., is again in operation after being idle six months.

The Cincinnati, Middletown and Dayton Traction Company proposes to build and operate an electric road, carrying passengers only, between Cincinnati and Dayton, O.

The board of trustees of the village of Goshen, N. Y., have refused to grant an application for an electric railway franchise. The board was unanimous in its denial of the application.

The street railway superintendents of the State of Massachusetts were entertained recently by Superintendent Sullivan, of Lowell, at the Lowell and Suburban road's Summer resort at Lakeview.

The United States Court has ordered the condemnation of the Gettysburg, Pa., Electric Railroad and has appointed a jury which will meet at Gettysburg August 1 to assess damages.

A petition has been filed for the appointment of a receiver for the Madison, Wis., street railway. It is reported to have forfeited interest on bonds and is said to owe $1,500 for power. It cost about $75,000 and is bonded for $150,000.

The Lake Saltonstall Railroad Company has sold its entire property to the New Haven, Conn., Street Railway Company. The franchises of the former company from the State and the towns of East Haven and New Haven are included in the sale.

In the United States Court of Appeals at Nashville, Tenn., on June 26, the consolidated case of the Citizens' Street Railway against the city of Detroit, and the city of Detroit against the Detroit City Railway Company, were taken up and the hearing begun. The case involves about $3,000,000.

The Steubenville, O., Street Railway Company, built in 1895 by New York parties at a cost of $40,000 and which has been run at a big loss, has been sold by the sheriff for $12,365 to a Steubenville syndicate who will extend, re-equip and operate the line.

Subscriptions to the Cohoes, N. Y., Electric Railway amount to nearly $.0,000. It is likely that the surveys for the new road will be made the latter part of July or early in August, and if possible the tracks will be laid and cars running before snow flies.

Negotiations were closed recently whereby the Elkhart, Ind., Street Railway was formally transferred to the Indiana Electric Railway Company. The work of connecting Goshen and Elkhart will commence at once. A new survey of the line is being made.

On the application of the St. Louis Trust Company, Superintendent W. T. Adams, of the Chattanooga, Tenn., Electric Railway, has been appointed receiver of the road. The company is bonded for $1,200,000 and failed to meet the interest on its mortgage bonds.

Only half of the $80,000 capital stock of the New Castle and Wilmington, Del., Electric Railway Company has been subscribed, and further movement will be postponed until the legislature can be asked to remove some of the restrictions by which the company is now hampered.

The Corsicana, Tex., street railway property, consisting of four miles of track, mules, cars and real estate, has been sold to Mr. R. B. Moffett, of Waxahachie. Mr. Moffett will at once put the road in good condition and begin its operation. The City Council has granted the company 90 days in which to start its cars. Can't some one trade Mr. Moffett an electric equipment for those mules?

The Pennsylvania Railroad Company is making an effort to secure control of the electric road running from Wilmerding to McKeesport, Pa. The Pennsylvania Railroad has now no passenger depot at McKeesport, and no means of getting into the city so as to compete with the Baltimore and Ohio for the passenger traffic. The intention is to double-track the electric line and improve the service, and thus compete with the Baltimore and Ohio on their own grounds.

Schuyler Electric Company.

It is now evident that those who hoped for the reorganization of the Schuyler Electric Company, of Middletown, Conn., have abandoned the idea, owing to insufficient encouragement and lack of financial support. A few business men, realizing what benefit to the city the business would be, have worked hard, but others, abundantly able, have showed little interest in the matter. From present appearances the factory will remain idle.

KINDRED INTERESTS

The Wallace Electric Company, 307 Dearborn street, Chicago, have just inaugurated an electrical house goods department. They are the direct representatives of the manufacturers and handle only standard goods. They have issued an attractive price list devoted to this department.

The Standard Electric Time Company, so long identified with the electrical interests of New Haven, Conn., have made an important change in the removal of their entire plant to Waterbury, Conn., where they occupy extensive quarters at 23 Jefferson street. Their facilities are greatly increased at the new location, and they are prepared to furnish the best electric time system in the world.

The National Telephone Manufacturing Company, of Boston, has just received its patent upon its little telephone, as shown on page iii, dated May 29, 1894. This telephone, it is reported, is admitted by high authorities to be the strongest instrument before the country to day. It is understood that this company has also a transmitter said to be much superior to the "Blake." it has been suggested that this company is one of the very few selling telephones instead of stock.

Outings.—"Mountains, Lakes and Sea. shore" is the title of a handsomely gotten-up Summer guide book just issued by the passenger department of the New York and New England Railroad. It is arranged in convenient pocket size and gives in concise and entertaining form a description of the innumerable points of interest along the New York and New England system. This publication demonstrates, among other things, that there is no need of going away from southeastern New England for a satisfactory and economical country vacation. Copies of the book may be had on application to W. R. Babcock, general passenger agent New York and New England Railroad, Boston, or of local ticket agencies. Enclose two cent stamp for postage.

The Second of the series of booklets which the New York Belting and Packing Company, Limited, 15 Park Row, New York, are issuing on the different specialties they manufacture has come to hand. It is entitled "Buried Treasure," and treats of their well-known "Leatherite" cotton and "Test" carbolized rubber fire hose. On the cover appears a handsome lithographed figure of a fireman holding a divining rod in his hands apparently searching for hidden treasure. This buried treasure, the reader discovers on turning the cover, is their rot proof "Leatherite" hose, a piece of which was buried in damp earth a short time since, and left for six months, at the expiration of which time it was dug up and found as perfect as when it came from the loom. "Leatherite" hose is made by this company only.

The Electric Storage Battery Company, Philadelphia, manufacturers of the chloride accumulator, have issued a handsome new catalogue which contains much that is valuable to the user of secondary batteries. The testimonials published in the catalogue are from people of such recognized authority that there is no room for doubt as to the good qualities of the chloride accumulator. Two new types of elements, in response to a demand, have been added to the Electric Storage Battery Company's list. These are called type C and type D, the latter being half the capacity of type E, formerly the smallest size quoted. Type C is half the capacity of type D. There is also in this new catalogue an interesting description of accumulators for traction work and the experience of the street railways in Paris operating with the chloride accumulator.

Good Telephone Books.

"PRACTICAL INFORMATION FOR TELEPHONISTS,"
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Description of Receivers, Transmitters, Switch Boards, Complete Instrument Switches and Switch Boards, Erecting Telephone Lines, Overhead Wires, Instruments, Connecting, Testing for and removing faults.
256 Pages. Illustrated. Price, $2.00.

"TELEPHONE LINES AND THEIR PROPERTIES,"
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Price, $1.50.

"MANUAL OF TELEPHONY,"
BY W. H. PREECE AND ARTHUR T. STUBBS.
Price, $4.50.

"THE ELECTRIC TELEPHONE,"
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